b) Explain the sensing properties of functionalized Au Nanoparticles for heavy metal ions.

c) Explain **MEMs**. What are the applications of **MEMs** ?

d) Define Janus particle. How core-shell nanoparticles differ from an ordinary system ?

e) Write the full form of common analytical tools used for the characterization of materials :

(i) EDX (ii) LVSEM (iii) DLS (iv) AFM ; Mention the utility of these tools in the field of material characterizations. $2+1+1\frac{1}{2}+1\frac{1}{2}+2$

M. Sc. Chemistry Examination, 2017

(4th Semester)

Inorganic Chemistry Special

Paper - XVI-I

Time : Two hours Full Marks : 50

(25 Marks for each Unit)

Use a separate answerscript for each unit.

UNIT – I- 4161

1. Answer ***any two*** of the following :

   a) Highlight the difference between the two types of catalysts that are used for hydrogenation of alkenes. Illustrate the mechanism of catalysis for each type. 2+3+3

   b) Outline the synthesis of a Fischer carbene complex and a Schrock carbene complex. Mention the basic differences between these two types of carbene complexes. 2+2+4

   c) What is olefin metathesis ? Describe the Grubbs' catalyst and show how it catalyzes the olefin metathesis. 2+2+4

2. Answer the following : 3×3

   a) Give an example of a catalytic asymmetric reaction, and describe the catalyst used in it.

b) What are N-heterocyclic carbenes ? How are they synthesized ? Comment on their stability.

c) Describe the structures of $[Ru^{II}(C_6Me_6)_2]^{2+}$ and $[Ru^{o}(C_6Me_6)_2]$. Highlight, with reasoning, the difference(s) between the two structures.

UNIT – I- 4162

3. Answer ***any nine*** from the following : 1×9

a) What is the convenient method to introduce optical activity in the structure of coordination polymer ?

b) How dendrimers are playing a role in drug delivery ?

c) What will be the general structural transformation in metal organic framework if the ligand to metal ratio increased from 1:1 to 2:1 ?

d) How SHAB principle has been exploited in the design of coordination polymers ?

e) What are the basic techniques involved with the characterizations of the porous coordination polymers ?

f) Why resolution power of an electron microscope (**EM**) is higher than optical microscope (**OM**) ?

g) What are false positive and false negative sensors ? Give one example of each.

h) What are the different patterns of **TEM** studies and how it helps to understand the crystallinity of the samples ?

i) Define microstrain. Write the Scherrer's equation for the calculation of grain size of nanoparticles. How it relates to dislocation density along the diffracted planes ?

j) What are optoelectronic materials ? Give two examples of molecular clusters and met-cars.

4. a) What is third generation porous material ? How does it differ from second generation porous material ? Name two unique application of third generation porous material.

b) What do you mean by flexible bridging ligand ? How the bridging angle of a linker directs the formation of an overall structure in metal organic frameworks ?

1+1+2+1+3

5. a) Explain the mechanical ball milling process for the synthesis of Nanostructured materials. Give one example of it. Explain their catalytic behavior towards hazardous chemicals.